

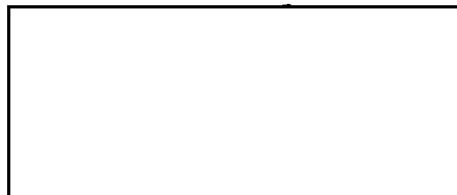
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Quarterly Status Report No. 3
December 11, 1963 - March 10, 1964

ASPHERIC OPTICAL SYSTEMS

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Abstract

Three and four element optimum designs are now completed. We have started to add aspheric surfaces. Thin films of SiO have been made.

Design Studies

The design study of three element and four element all spherical surface designs is now essentially complete. The designs clearly represent the limitations with all spherical surfaces. These designs are being described in a paper to be presented at the Tokyo ICO meeting in August. A preprint of this article will be included in the appendix of the fourth quarterly report.

We have encountered difficulties in attempting to design systems with several aspheric surfaces. There are so many solutions possible that we find it difficult to locate the optimum regions of solution. Our present method is to find third and fifth order solutions. With aspheric surfaces we can find solutions easily but often they are balances between large fifth order coefficients. This introduces higher order aberrations. We have had to devise methods for driving down these high order aberrations. The Ordeals program is not being modified to correct a selected group of rays.

Production of Aspheric Surfaces

Several thin films of SiO have been made. So far they tend to have a yellow color and scatter light. The yellow color

and scattering may be reduced by proper regulation of the rate of evaporation and the oxygen pressure.

When the present films are thin the yellow color is acceptable. It appears possible to introduce about 10 wavelengths of optical retardation. This is not as much as we anticipate needing for good aspheric correction.

We plan to spend the next two quarters on this phase of the research. At that time a decision will be made as to whether to continue with this approach, or whether to go on to other methods.

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Quarterly Status Report No. 2
September 11 - December 10, 1963

ASPHERIC OPTICAL SYSTEMS

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Abstract

The activities during this period of the contract have centered around design studies of optical systems using aspheric surfaces and preparation of coating procedures for making aspheric surfaces.

Design Studies

We have been studying a specific design problem, to design an $f/6$, 24 inch focal length lens to cover a 9" x 9" field. This is a typical moderate field lens which should enable us to establish the technique for comparing aspheric designs with all spherical designs. At present we have nearly fully explored the possibilities with three lenses using spherical surfaces. The next step is to use four elements. After this we can compare these designs with designs using aspheric surfaces.

Production of Aspheric Surfaces

In a parallel effort we are studying methods for making aspheric surfaces. During this period we have been studying feasibility of using vacuum coating of Silicon Monoxide. Our evaporation equipment has been modified to enable us to coat SiO in reasonably thick layers. We have installed a special crucible and an oxygen pressure controller and made a few coatings.